

Deep and surface circulation in the Northwest Indian Ocean from Argo, surface drifter, and in situ profiling current observations.

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The northwest Indian Ocean is a region of complex circulation and atmospheric influence. This study encompasses the surface and deep circulation in the region ranging from 0°N-35°N and 40°E-80°E from January 2002-December 2009. Emphasis is in the Persian Gulf, Oman Sea and Arabian Sea (roughly from 21°N-26°N and 56°E-63°E) using a variety of in situ and observation data sets.

In situ and observation data sets include data from Argo floats (US GODAE), surface drifters (AOML) and an observation observatory in the Oman Sea. The observing system in the Oman Sea was installed by Lighthouse R & D Enterprises, Inc. beginning in 2005, and measures current, temperature, conductivity, pressure, dissolved oxygen and turbidity, using the Aanderaa Recording Doppler Current Profiler (RDCP) 600, Recording Current Meter (RCM) 11, and RDI 75-kHz ADCPs. The cabled ocean observatory measures dissolved oxygen, temperature and salinity between 65 and 1000m and reports in real-time. Argo floats in the region have a parking depth range from 500 m to 2000 m.

The general surface circulation in the northwest Indian Ocean is largely influenced by seasonal monsoon winds. During the transition from the winter monsoon to the summer monsoon, current direction largely reverses. Seasonal coastal currents contribute to eddy formation. Marginal sea inflow and outflow are also seasonally variable. This greatly impacts the physical water mass properties in the region.

A quantitative analysis of sea surface temperature (MODIS) and sea surface height (CCAR) shows that changes in Argo temperature and salinity data are associated with seasonal temperature and evaporation changes as well as coastal upwelling. Eddy circulation is seen in the subsurface in the Oman Sea and Arabian Sea west of the Murray Ridge in addition to the seasonal influence of marginal seas. The deeper circulation below 1000 m depth is more variable than the surface circulation and does not show significant seasonality. However, generally the flow is intensified near bathymetric gradients and quiescent in the open ocean. Additionally, deep float tracks in the open ocean tend to follow surface eddy features.

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